


TRANSMITTAL LETTER OF THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		Attorney Docket No. 0502-1003 U.S. Application No. 10/088022
INTERNATIONAL APPLN. NO. PCT/FR00/02574	INTERNATIONAL FILING DATE 15 September 2000	PRIORITY DATE CLAIMED 17 SEPTEMBER 1999
TITLE OF INVENTION: DEVICE FOR PROTECTING AGAINST VOLTAGE SURGES		
APPLICANT(S) FOR DE/EO/US: FRANÇOIS GIRARD		
Applicant herewith submits to the United States Designated Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. 4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c)(2)) <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau) b. <input type="checkbox"/> has been communicated by the International Bureau. See attached PCT/IB/308. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)) <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)) <ol style="list-style-type: none"> a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <p>Items 11 to 20 below concern document(s) or information included:</p> <ol style="list-style-type: none"> 11. <input checked="" type="checkbox"/> Information Disclosure Statement (IDS) w/PTO-1449 - <input checked="" type="checkbox"/> Copy of IDS citations 12. <input type="checkbox"/> Assignment Papers (cover sheet & document(s)) 13. <input checked="" type="checkbox"/> A FIRST Preliminary Amendment. 14. <input type="checkbox"/> A SECOND or SUBSEQUENT Preliminary Amendment. 15. <input type="checkbox"/> A substitute specification. 16. <input type="checkbox"/> A change of power of attorney and/or address letter. 17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 19. <input type="checkbox"/> A second copy of the English language translation of the international application (35 U.S.C. 154(d)(4)). 20. <input checked="" type="checkbox"/> Other items or information: <u>Abstract on a separate sheet, Application Data Sheet, International Preliminary Examination Report (PCT/IPEA/409), International Search Report</u> 		

JC13 Rec'd PCT/PTO 14 MAR 2002

U.S. APPLICATION NO. 107 088022		INTERNATIONAL APPLN. NO. PCT/FR00/02574	ATTORNEY DOCKET NO. 0502-1003
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1)-(5): Neither international preliminary examination fee nor international search fee paid to USPTO and international Search Report not prepared by the EPO or JPO\$1040.00 International preliminary examination fee not paid to USPTO but International Search Report prepared by the EPO or JPO\$890.00 International preliminary examination fee not paid to USPTO but International search fee paid to USPTO\$740.00 International preliminary examination fee paid to USPTO but all claims did not satisfy provision of PCT Article 33 (1)-(4).....\$710.00 International preliminary examination fee paid to USPTO and all claims satisfied provision of PCT Article 33 (1)-(4).....\$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT Surcharge of \$130.00 for furnishing the oath or declaration than <input type="checkbox"/> 20- <input checked="" type="checkbox"/> 30 Months from the earliest claimed priority date (37 CFR 1.492(e))			CALCULATIONS PTO USE ONLY
			\$ 890.00
			\$ 130.00
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total Claims	10 - 20 =	0	X \$18.00
Independent Claims	1 - 3 =	0	X \$84.00
MULTIPLE DEPEND CLAIM(S) (if applicable)			+ \$280.00
TOTAL OF ABOVE CALCULATION -			\$ 1,020.00
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+ \$ 510.00
SUBTOTAL =			\$ 510.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492Z(f)).			\$
TOTAL NATIONAL FEE =			\$ 510.00
Fee for recording the enclosed assigned (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) \$40.00 per property +			\$
TOTAL FEES ENCLOSED -			\$ 510.00
			Amount to be refunded: \$
			Charged: \$
<input checked="" type="checkbox"/> A Check in the amount of \$510.00 to cover all fees is attached. <input type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to Deposit account No. 25-0120 in the name of Young & Thompson, as described below. A duplicate copy of this sheet is enclosed. <input checked="" type="checkbox"/> The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fee required under 37 C.F.R. §§ 1.16 or 1.17.			
SEND ALL CORRESPONDENCE TO: 745 South 23 rd Street Arlington, VA 22202 Telephone (703) 521-2297 Y&T Customer No. 000466		 00466 <small>PATENT, TRADEMARK OFFICE</small>	SIGNATURE <i>Benoit Castel</i> NAME Benoit Castel 35,041 REGISTRATION NO.
BC/lmt Date: 14 March 2002			

10/088022

JC13 Rec'd PCT/PTO 14 MAR 2002

PATENT
0502-1003

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of: François GIRARD

Appl. No.: **NEW NATIONAL PHASE
APPLICATION IN THE
UNITED STATES** Group:

Filed: March 14, 2002 Examiner:

For: **DEVICE FOR PROTECTING
AGAINST VOLTAGE SURGES**

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents March 14, 2002
Washington, DC 20231

Sir:

Prior to the first Official Action and calculation of the filing fee, the following preliminary amendments and remarks are respectfully submitted in connection with the above-identified application.

IN THE ABSTRACT OF THE DISCLOSURE:

Please replace the Abstract of the Disclosure with the rewritten Abstract of the Disclosure attached on a separate sheet attached hereto.

IN THE CLAIMS:

Please amend the claims as follows:

--3. (amended) Device according to Claim 1, characterized in that a disconnecter (4) is disposed upstream of the common terminal of the two elements (1, 3) which is connected to the line (5, 7) to be protected.--

--4. (amended) Device according to Claim 1, characterized in that it is formed by an envelope of substantially cylindrical shape of which the two ends are formed by two metal rings (10, 12) insulated from one another constituting its two terminals, each of them being respectively connected to said common terminals of the two elements (1, 3).--

--6. (amended) Device according to Claim 4, characterized in that the varistor (3) has the shape of a tube which is disposed around the Zener diode lightning arrester element (1') so that its longitudinal axis merges with the longitudinal axis (yy') of the cylindrical envelope.--

--9. (amended) Device according to Claim 7, characterized in that the space inside said inner tube (20) is filled with an insulating and resistant product such as in particular an epoxy resin.--

--10. (amended) Device according to Claim 1, characterized in that it is constituted by a connector support (23) which comprises means for respectively

receiving the elements (1, 3) and which ensures their connection in parallel as well as the connection of their respective common terminals with the terminals of the device.--

REMARKS

Claims 3, 4, 6, 9, and 10 have been amended to eliminate multiple dependencies.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly requested.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any

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additional fees required under 37 C.F.R. § 1.16 or under 37
C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON

Benoit Castel

Benoit Castel, Reg. No. 35,041

745 South 23rd Street
Arlington, VA 22202
Telephone (703) 521-2297

BC:lm
Attachments

Docket No. 0502-1003

DEVICE PROTECTING AGAINST VOLTAGE SURGES

ABSTRACT

A device for protection against voltage surges in an electric power supply line includes at least two elements (1', 3), namely a Zener diode lightning arrester (1') fast-blow in short circuit, and a varistor (3), arranged in parallel. One of the terminals common to the two elements (1', 3) is connected to the line to be protected, and the other common terminal is connected to earth or to a common conductor element.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE**IN THE ABSTRACT OF THE DISCLOSURE:**

The Abstract of the Disclosure has been amended as follows:

DEVICE PROTECTING AGAINST VOLTAGE SURGES**ABSTRACT**

~~The invention concerns a~~ device for protection against voltage surges in an electric power supply ~~line.~~ Said device is characterized in that it ~~comprises~~ line includes at least two elements (1', 3), namely a Zener diode lightning arrester (1') fast-blow in short circuit, and a varistor (3), arranged in ~~parallel,~~ one parallel. One of the terminals common to ~~said~~ the two elements (1', 3) ~~being~~ is connected to the line to be protected, and the other common terminal ~~being~~ is connected to earth or to a common conductor element.

IN THE CLAIMS:

The claims have been amended as follows:

--3. (amended) Device according to ~~one of Claims 1 or 2,~~ Claim 1, characterized in that a disconnecter (4) is disposed upstream of the common terminal of the two elements

--10. (amended) Device according to ~~one of Claims 1~~
~~or 2~~, Claim 1, characterized in that it is constituted by a
connector support (23) which comprises means for
respectively receiving the elements (1, 3) and which
ensures their connection in parallel as well as the

Docket No. 0502-1003

connection of their respective common terminals with the
terminals of the device.--

DEVICE FOR PROTECTING AGAINST VOLTAGE SURGES

The present invention relates to a device intended to ensure protection of electrical apparatus against voltage surges which sometimes occur on the conductors used in electric energy distribution networks, particularly in the event
5 of lightning striking.

The prior state of the art has proposed a very diverse quantity of lightning arrester devices which are connected between a wire of the network and earth or a common conductor element, and which comprise components which, in normal functioning, act like neutral elements but which, in the event of violent voltage
10 surge, become conducting so that they divert the current due to the voltage surge and in particular to the lightning, thus protecting the installation disposed downstream against the destructive effects of such voltage surge.

The technical characteristics which are required of such apparatus are very varied, with the result that, up to the present time, no lightning arrester device on
15 the market totally satisfies all the necessary characteristics:

The latter are the following:

- very short response time,
- very great power of flow of the current,
- very low residual voltage,
- 20 - continuity of the service, and of the protection,
- cost price having to be able to be determined as a function of the cost of the apparatus and of the devices to be

protected.

In order to perform such a function, it has been proposed to use gas discharge arresters. However, these latter possess noteworthy drawbacks and in particular that of presenting a considerable delay at ignition so that, in certain cases, and especially in the case of particularly violent and rapid voltage surges provoked by lightning, the electronic apparatus deteriorate before the lightning current is diverted by the discharge arrester.

Varistors have also been employed which present the advantage of absorbing considerable thermic and electric energies without being destroyed, when they are subjected to current impulsions, so that they thus make it possible to peak-clip a voltage surge, particularly provoked by lightning, without the supply of current of the apparatus that the device intends to protect being interrupted. An example of a characteristic of varistor is represented in Figure 1 (curve b).

However, it is generally known that a lightning arrester is a device which is connected between a line to be protected and earth or a common conductor element, and which becomes conducting when a transitory voltage surge occurs and which, by flowing off the energy therefrom, protects the sensitive electronic equipment disposed downstream, against the destructive effects of this voltage surge. It is thus understood that a lightning arrester of ideal type must not conduct the electric current when the voltage at its terminals is normal and must rapidly conduct a large quantity of current when the voltage becomes

abnormal, while maintaining the voltage surge at an acceptable level.

Now, the principal drawback of varistors is that, under the effect of repeated electric shocks, and by reason of the high operational temperatures, they are subjected to wear which is translated by a resistive fast-blow by lowering of the peak-clipping threshold. One is thus obliged to introduce disconnectors (standard NFC 61-740 July 1995 and standard CEI 61653-1 of March 1st, 1998) in the energy lines, whose purpose is to open the circuit in the case of fast-blow in order to avoid a fire being started. One of the disconnectors used is obligatorily disposed inside the body of the lightning arrester, which brings about elimination of the protection as soon as it is actuated.

Such a mode of operation is extremely risky at the level of protection of an installation insofar as, during a storm, the voltage surges follow one another at a certain rhythm depending on the different thunder claps. Various means intended to overcome this drawback have therefore been proposed, particularly by disposing a plurality of varistors in parallel, which is possible thanks to the importance of the slope (U/I ratio) of their characteristic. Such a placing in parallel may be effected with the aid of varistors of different values, which makes it possible to monitor, to a certain extent, the order of their destruction.

It is also known that another drawback of the varistors is that they present too high a residual voltage in the case of a very rapid voltage front

and in the case of very strong currents.

Lightning arrester devices have also been proposed, employing Zener diodes which present the advantage of not being influenced by wear due to repeated electric shocks and of operating at high temperatures. These lightning
5 arresters are such that, once the Zener diode is destroyed due to a voltage surge, they immediately become conducting, with the result that they conduct the voltage surge to earth. In that case they present a considerable capacity of flow of the currents and very weak residual voltages, and this in all cases.

Unfortunately, lightning arresters of this type present the drawback of
10 being of a high cost, insofar as the Zener diodes used are constructed from monocrystalline silicon which is much more expensive than the products used for producing the varistors and which must be disposed between heat-dissipating discs made of copper or silver. Such lightning arresters must therefore be constructed with a large number of discs which is a function of the magnitude of
15 the energy that it is desired to absorb before destruction of the element in short-circuit.

Nonetheless, despite their cost, such lightning arresters are, however, interesting, since, after they are destroyed, they ensure a continuity of the protection of the apparatus that they are intended to protect.

20 Patent DE-U-298 08 365 also discloses a high voltage protection circuit intended to protect low input impedance measuring devices

making it possible to avoid different problems which are encountered on the conventional circuits and in particular current loss effects during high-precision measurements.

5 This circuit, whose purpose is different from the one forming the subject matter of the present Application, comprises a varistor and a Zener diode which are associated. However, the terminals of these two elements are not common and the circuit can therefore not perform the function of the circuit according to the invention.

10 The present invention has for its object to overcome the various drawbacks of the prior art by proposing a device for protection against voltage surges, and particularly against the effects of lightning, which satisfies all of the different conditions envisaged hereinabove.

15 The present invention thus has for its object a device for protection against voltage surges in an electric power supply line, characterized in that it comprises at least two elements, namely at least a Zener diode lightning arrestor of the fast-blow in short circuit type, and a varistor, whose terminals are common and which are arranged in parallel, one of the terminals common to these two elements being connected to the line to be protected, and the other common terminal being connected to earth or to a common conductor element.

20 The varistor element may be associated with a disconnecter which will be disposed between it and the line to be protected. Furthermore, a disconnecter may be disposed upstream of that common terminal of the two elements which is connected to the line to be protected.

In a particularly interesting form of embodiment of the invention, the device will be constituted by an envelope of substantially cylindrical shape, of which the two ends will be formed by two metal rings insulated from each other, which will constitute its two terminals, each of them being respectively joined to
5 said common terminals of the two elements. The Zener diode lightning arrester will preferably be disposed along the longitudinal axis of the cylindrical envelope. The varistor element will take the shape of a tube which will be disposed around the Zener diode lightning arrester element, so that its longitudinal axis merges with the longitudinal axis of the cylindrical envelope. Furthermore, the inner and
10 outer surfaces of the varistor element may be respectively in contact with an inner metal tube and an outer metal tube which will form its electrodes and which will be respectively in contact with the metal rings.

Interestingly, the connection between the metal ring and the outer tube is ensured by welding spots whose volume and number are such that they are
15 adapted to melt under the effect of a voltage surge so as to perform a function of disconnecter.

The interior space of the inner tube may be filled with an insulating, resistant product such as in particular an epoxy resin.

The protection device according to the invention may also be constituted
20 by a connector support which comprises means for respectively receiving the elements which ensures their connection in parallel as well as the

connection of their respective common terminals with the terminals of the device.

Figure 1 is a graph representing the characteristics (i.e. the variation of the voltage as a function of the current), on the one hand, of a lightning arrester of the type incorporating Zener diode (curve a) and, on the other hand, of a varistor
5 (curve b).

Figure 2 is a diagram showing a protection device according to the invention and its practical arrangement on a current line to be protected.

Figure 3 is a view in axial and longitudinal section of a form of embodiment of a protection device according to the invention.

10 Figure 4 is a view in perspective of a second variant embodiment of a protection device according to the invention.

As shown in Figure 2, two lightning arrester elements have been associated in parallel, namely a Zener diode lightning arrester element of the type in which a short circuit is established between its terminals when a certain level of voltage
15 surge is attained, and a varistor 3, so that their respective terminals c and c', on the one hand, and d and d', on the other hand, are common.

The lightning arrester is intended to ensure protection of an electric line 5. To that end, one of the common terminals c, c' of the two lightning arrester elements 1 and 3 is connected to line 5 and their other common terminal d, d' is
20 connected to earth. A disconnecter 4 is disposed on the line 5 upstream of the lightning arrester elements 1 and 3 and another disconnecter 6 is disposed just upstream of the

varistor 3. The other line 7 of the installation may be protected in the same way.

Figure 1 shows the respective characteristics a and b of the two lightning arrester elements 1 and 3, i.e. the variation of the voltage V at the terminals of an element as a function of the intensity I of the current which traverses it. In this way, four zones I, II, III, IV can be distinguished, as a function of the value of the current.

Concerning element 1, which is the lightning arrester comprising a Zener diode, it is observed that: in the first zone I, a very weak current is established and corresponds to the polarization of the Zener diode. In the second zone II, which corresponds to a so-called avalanche zone, the voltage is almost constant whatever the current which traverses the lightning arrester. In the third zone III, the electric power established, which corresponds to the product of the voltage maintained by the current, generates, within the lightning arrester, considerable heat which provokes fusion of the elements and which gives the assembly a very low definitive electric resistance. In the fourth zone IV, the resistance having become very weak, the voltage at the terminals of the lightning arrester rises little despite the very high currents. It is known that the process of peak-clipping which is effected in zones I and II is a process of reversible nature creating no wear and no change of the characteristics of the lightning arrester. Inversely, in zone III, there is a sudden and irreversible change of the characteristics.

As shown in the same Figure 1, the corresponding characteristic of element 3, namely the

varistor, lies beneath that of the lightning arrester element 1, so that, when the two lightning arrester elements are associated in parallel and their respective connection terminals are common and they are consequently supplied at their ends by the same voltage, it is the element 3 constituted by the varistor which
5 ensures the delivery of the current (since for a voltage of about 500 volts at the terminals of these two elements the varistor 3 will deliver a current with an intensity of the order of 0.05 milliamperes while the current delivered in the lightning arrester will be of the order of about 5 microamperes). The association in parallel, with common terminals, of the varistor 3 and of the lightning arrester 1
10 essentially constituted by a Zener diode, will make it possible, when the voltage at the terminals of the varistor attains the avalanche value of the Zener diode, to continue to conduct the current until the blow-out power of the Zener diode is attained, which will be produced for a current value much higher than what it would have been without the association of the varistor.

15 Figure 3 shows a practical example of implementation of a lightning arrester device. This lightning arrester device is of substantially cylindrical shape, with longitudinal axis yy' . It comprises two metal end rings 10 and 12 which constitute the two connection terminals of the lightning arrester. One of these rings, the lower ring 12 in the drawing, is connected by welding of a metal tube
20 14 of smaller diameter. Each of the two metal rings 10, 12 receives, in a zone close to its end, a metal disc 16 with which it is connected by welding. There have been arranged along the

longitudinal axis yy' of the device, two Zener diode lightning arrester elements 1' of the fast-blow in short circuit type. These two elements 1' are arranged in series and are connected by a tubular metal join 18 so that their end terminals are respectively welded to the discs 16 at the centre thereof. The two Zener diode lightning arrester elements 1' are of the type in which, under the effect of a very high power, they short circuit definitively. Such lightning arresters are in particular of the type such as those described in Patents FR-A-2 511 556 and FR-A-2 585 892.

The two lightning arrester elements 1' are surrounded by a metallic tubular element 20 which is welded to one of these ends on the upper disc 16 and which constitutes an armour intended to give it a sufficient mechanical strength to allow it to withstand the high powers which are generated by the currents developed by the phenomenon of lightning, and this for a sufficient time allowing the possible disconnector devices to be activated.

The varistor 3 has a tubular shape and its inner face is in contact with the inner tube 20 which thus constitutes one of its electrodes and its outer face is in contact with the outer tube 14 which constitutes its other electrode. This tube 14 is joined to the ring 12 by welding.

In this particular form of embodiment of the invention, the welding which joins the ring 12 to the tube 14 may be made to perform the role of disconnector 6, i.e. it melts in the event of a voltage surge. To that

end, this weld 6' may be a solder of which the volume will be determined so as to provoke its fusion under specific conditions. In particular, it may be constituted by a series of spots distributed on the periphery of the join of the ring 12 and of the tube 14.

5 The inner volume of the tube 20, as well as that defined by the inner walls of the ring 12, are filled with a resin 21, for example a thermosetting or epoxy resin. This resin is chosen, on the one hand, for its qualities of insulator but also, on the other hand, for its qualities of adherence with the case elements with which it is in contact as well as for its inherent qualities of mechanical resistance.

10 The device according to the invention for protecting against voltage surges may, of course, be constituted with another structure.

As shown in Figure 4, the protection device comprises a modular embeddable case 23, of the standardized type, comprising a first cylindrical housing allowing it to receive a Zener diode lightning arrester element 1' of substantially cylindrical shape and a second housing of parallelepipedic shape allowing it to receive a varistor 3' of the same shape. The case 23 comprises inner connection means making it possible to place the two lightning arrester elements 1' and 3' in parallel and to ensure the connection of their respective common terminals with the terminals of the device, as well as a disconnecter associated with the varistor.

20

CLAIMS

1. Device for protection against voltage surges in an electric power supply line, characterized in that it comprises at least two elements (1, 1', 3), namely at least a Zener diode lightning arrester (1, 1') of the fast-blow in short circuit type,
5 and a varistor (3), whose respective connection terminals are common and which are arranged in parallel, one of the terminals (c, c') common to these two elements (1, 1', 3) being connected to the line (5, 7) to be protected, and the other common terminal (d, d') being connected to earth or to a common conductor element.
2. Device according to Claim 1, characterized in that the varistor (3) is
10 associated with a disconnecter (6, 6') which is disposed between it and the line (5, 7) to be protected.
3. Device according to one of Claims 1 or 2, characterized in that a disconnecter (4) is disposed upstream of the common terminal of the two elements (1, 3) which is connected to the line (5, 7) to be protected.
- 15 4. Device according to one of the preceding Claims, characterized in that it is formed by an envelope of substantially cylindrical shape of which the two ends are formed by two metal rings (10, 12) insulated from one another constituting its two terminals, each of them being respectively connected to said common terminals of the two elements (1, 3).
- 20 5. Device according to Claim 4, characterized in that the Zener diode lightning arrester element (1, 1') is

arranged along the longitudinal axis (yy') of the cylindrical envelope.

6. Device according to one of Claims 4 or 5, characterized in that the varistor (3) has the shape of a tube which is disposed around the Zener diode lightning arrester element (1') so that its longitudinal axis merges with the longitudinal axis (yy') of the cylindrical envelope.
7. Device according to Claim 6, characterized in that the inner and outer surfaces of the varistor (3) are respectively in contact with an inner metal tube (20) and an outer metal tube (14) which form its electrodes and which are respectively in contact with the metal rings (10, 12).
8. Device according to Claim 7, characterized in that the connection between the metal ring (12) and the outer tube (14) is ensured by welding spots whose volume and number are such that they are adapted to melt under the effect of a voltage surge so as to perform a function of disconnecter.
9. Device according to one of Claims 7 or 8, characterized in that the space inside said inner tube (20) is filled with an insulating and resistant product such as in particular an epoxy resin.
10. Device according to one of Claims 1 or 2, characterized in that it is constituted by a connector support (23) which comprises means for respectively receiving the elements (1, 3) and which ensures their connection in parallel as well as the connection of their respective common terminals with the terminals of the device.

WO 01/22551

PCT/FR00/02574

DEVICE PROTECTING AGAINST VOLTAGE SURGES

ABSTRACT

5 The invention concerns a device for protection against voltage surges in an electric power supply line. Said device is characterized in that it comprises at least two elements (1', 3), namely a Zener diode lightning arrester (1') fast-blow in short circuit, and a varistor (3), arranged in parallel, one of the terminals common to said two elements (1', 3) being connected to the line to be protected,
10 and the other common terminal being connected to earth or to a common conductor element.

1/1

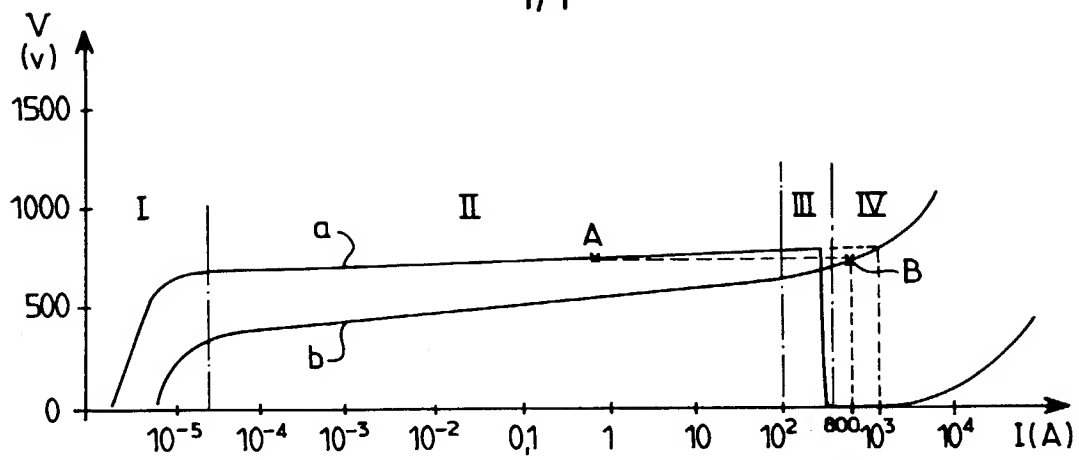


FIG. 1

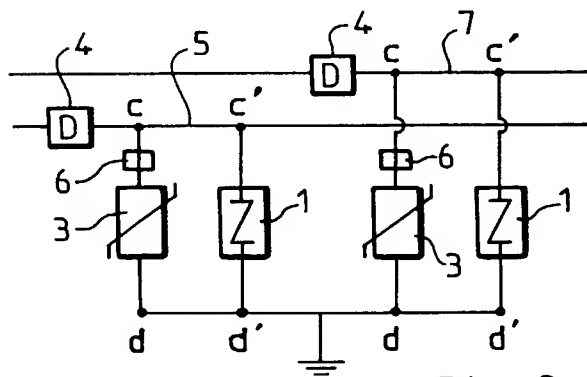


FIG. 2

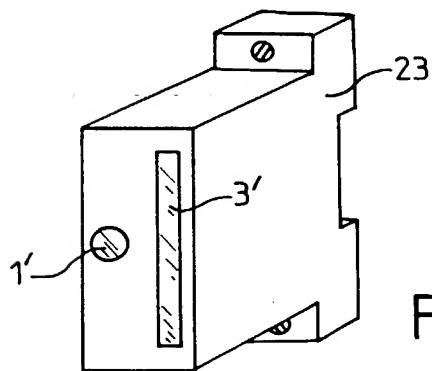


FIG. 4

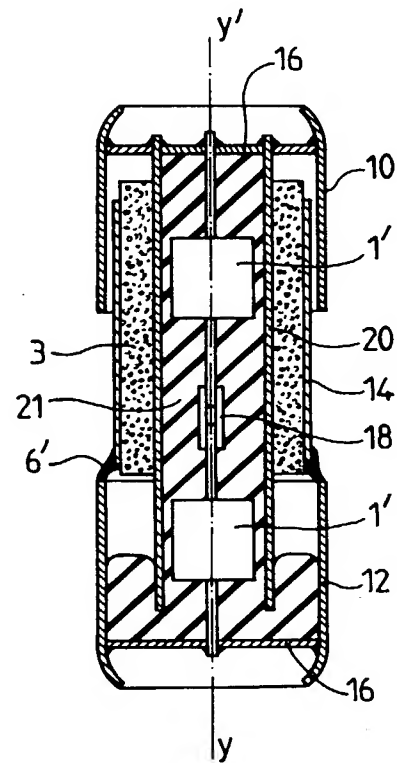


FIG. 3

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

DEVICE FOR PROTECTING AGAINST VOLTAGE SURGES

the specification of which: (check one)

REGULAR OR DESIGN APPLICATION

- ☐ is attached hereto.
- ☒ was filed on 14 March 2002 ✓ as application Serial No. _____
and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

- ☒ was described and claimed in International application No. PCT/FR00/02574 ✓ filed on September 15, 2000 ✓
and as amended on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

PRIORITY CLAIM

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

Country	Application Number	Date of Filing (day, month, year)	Priority Claimed
FRANCE	99/11656 ✓	17 September 1999 ✓	Yes

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional patent application(s) listed below:

Application No. _____ Filing Date _____ Status (patented, pending abandoned) _____

(Complete this part only if this is a continuing application.)

I hereby claim the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application No. _____ Filing Date _____ Status (patented, pending abandoned) _____

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POWER OF ATTORNEY

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from _____ as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

As a named inventor, I hereby appoint the following attorney(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoît CASTEL, Reg. No. 35,041, Eric JENSEN, Reg. No. 37,855, and Thomas W. PERKINS, Reg. No. 33,027, c/o YOUNG & THOMPSON, Second Floor, 745 South 23rd Street, Arlington, Virginia 22202.

Address all telephone calls to Young & Thompson at 703/521-2297.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-08 All name of sole or first inventor: François GIRARD
(given name, family name)

Inventor's signature _____

Date 11 Février 2002

Residence: Dijon, France

Citizenship: French ✓

Post Office Address: 29, rue Eugène Bussière
21000 DIJON - FRANCE